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ABSTRACT

While many hail computer-assisted instruction (CAI) as a panacea for education, there is little study of the emotional reactions of students and the stress in a CAI program. Stress is a condition that causes deviation from the normal routine of life and frequently arouses anxiety--beneficial at low levels. True individualization of CAI has not been achieved and the resulting evaluation is that CAI tends mostly to build up stress. In order to reduce stress in CAI programs we should create a physical environment conducive to learning, instruct the computer to compute the individual's threshold of stress, direct the computer to search for stress and take steps to reduce it when found, and during the learning process keep the student's evaluation confidential to the student. Recognition and reaction to stress should be accompanied by a notable increase in learning for students in CAI courses. (WH)

IMPLICATIONS OF STRESS AND MOTIVATION

ON

COMPUTER-AIDED INSTRUCTION

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Introduction

Computer-Aided Instruction (CAI) has yet to come of age; but still, many herald it as the panacea for education. However, much research needs to be done in the methods and techniques of course development if this dream is to become a reality.

There is very little published on the relationship between emotional reactions of students and their ability to successfully complete an evaluation instrument. Yet the basic concept of CAI is continual evaluation because, without an instructor present, the CAI course must rely on the continual evaluation of the student in order to guide the student through the course.

The response of students to CAI queries and their ability to browse through data, in my opinion, is affected by their emotional reaction (stress) while operating in a CAI environment. If the student responses are affected, so is their progress. Stress in turn is related to motivation since the degree of stress is related to the strength of the motive being threatened.

The impetuous behind this paper is to create an awareness in the minds of those contemplating using the computer for instructional purposes that the concepts of learning and stress show a positive correlation. With this awareness and a few positive suggestions for reducing stress (or being cognizant of its presence), the architects of CAI may be more effective in their development efforts.

Discussion of Stress on CAI

Stress can broadly be defined as a condition that causes one to deviate from his comfortable, normal, secure routine of life. This condition is often referred to as a threat to which the individual will tend to minimize or eliminate (coping). For a threat to occur, an evaluation must be made of the situation; therefore, one can consider the concept of threat to be anticipatory or future-oriented and brought about by cognitive processes involving perception, learning, memory, judgment, and thought. The causes of threat vary with the individual psychological makeup; and although it is brought about by cognitive processes, this process need not be rational or logical. The degree of the threat to the individual is dependent upon the strength of the motive being threatened.

Stress is the stimulus condition likely to arouse an affective response (anxiety). At low levels of anxiety there is a general alerting of the organism and an increase in vigilance. In this state there is an increased sensitization to outside events and an increased ability to cope with danger; thus, it is reported that low levels of distraction stress can lead to improved performance. However, as stress increases and anxiety mounts, the organism becomes less capable of mastery. There is a general rigidification, and individuals respond in terms of the more habitual and hence safer response tendencies. Anything novel is threatening and the ability to improvise is reduced. Increased effort has to be expended in order to maintain adequate behavior.

At higher levels of anxiety there is no longer the ability for effective action. The organization of behavior breaks down. Regression to simpler and more primitive modes of response occur, and the ability to differentiate the dangerous from the trivial becomes reduced.

At the current level of development, the courses for computer-aided instruction (CAI) do little more than teach facts. The great potential of the computer has yet to be unleashed to provide the "individualized" instruction the proponents of CAI claim for it. This individualized instruction coupled with adequate counciling and guidance from a teacher would personalize instruction to a far greater degree than is possible today in an average public school classroom. Individualizing CAI means that the computer and the student will engage in an instructional dialogue based upon both the subject matter and the personality of the student being taught.

One of these personality factors is the individual's ability to cope with stress. A learning plus evaluation environment, as exists in CAI, is subject to student stress by the very nature of the experience. In addition, the individuals using CAI are likely to be in the heavy stress group. That is, the teenager to young adult age group who are intelligent, working with their mind, conscientious, and ambitious. It must be recognized that CAI is a stress-producing situation and that the power of the computer should be used as a positive force in lessening the impact of stress on the student.

While it can be argued that stress can improve student performance, it is a dangerous motivator because the same stress that is an invigorating experience to one person can make another person sick. One's ability to cope with stress is highly personal and subject to wide fluctuations; it is to a large degree dependent upon how one views his ability to deal with a situation. Also, there have been many studies which show that students perform better in a less stressful environment.

Recommendations

Our knowledge of stress is limited but the effects are well known. Therefore, based on the premise that learning is improved as stress is reduced, the following four recommendations to reduce stress are offered to the innovators of CAI for their consideration in future CAI course and terminal design.

I. Create a physical environment conductive to learning.

A disordered, poorly lighted, noisy, and unattractive physical plant reduces one's ability to resist either physical or mental stress. Again, one's personal appraisal of the situation sets one's mental position regarding his ability to cope with the situation. If the physical plant is such that a person's attitude is adversely affected, a self-fulfilling prophesy of failure will be invoked.

In terminal and physical plant design, appearance should be a copartner with mechanical excellence. The color should be pleasing to the eye, as many senses as possible should be brought into the instruction process, the terminal should be comfortable to sit at and easy to use, as little use of the typewriter as possible should be used to transmit data to the student, and the classroom should be quiet and pleasing to the student. We all know intuitively the value of a good instructional setting in promoting learning. When this same intuitive knowledge is coupled with an understanding of stress, the value of environment can be placed in proper perspective.

II. The computer should be instructed to compute an individual's threshold of stress.

Much of the knowledge in the field of stress is centered around the response to stress. While the causes of stress vary greatly between individuals and cultures, the rules concerning the coping processing can be considered universal. It is then the coping process upon which the emphasis must be placed in order to determine an individual's threshold of stress. The computer could be provided with background material about the student which might include biographical, IQ, aptitude, and attitude data. This data, coupled with a series of tests designed to evaluate a

student's reactions (coping process), both physical and mental, to typical life situations, would provide data to the computer on how a student might react to a given situation. Although such tests do not exist today in the format needed, most of the knowledge exists in the fields of psychiatry and sociology. The contention here is that if a computer can be provided knowledge on how a person will react to a given situation, perhaps direct confrontations could be avoided and thus learning increased because stress is reduced.

III. The computer should continually search for student stress and, if encountered, invoke steps to reduce stress.

This step, of course, is dependent upon the computer having access to knowledge about the student being instructed. However, some general evaluation should prove beneficial. We know that stress will cause a change in the adequacy of cognitive functioning; and if the stress is helpful in improving learning, so much the better. However, stress that impairs learning can be detected by the response patterns of students. Below are listed seven behaviors that could be considered typical to increasing stress.

A. Excessive time to respond to questions.

B. A noted increase in student error rate.

C. A deviation from directions after a period of following directions correctly.

D. Misspelling of easy words.

E. Forgetting of facts just learned.

F. Frequent stops or long pauses between learning cycles.

G. Misuse of equipment (rough use of equipment).

The computer could periodically give the student generalized tests of reasoning to obtain results for comparison against the student norms. Deviations from his norm would indicate stress affecting the cognitive process.

An excellent source of stress indication is a direct indication by the student. He could be instructed to indicate to the computer stressful states such as anger, frustration, fear, confusion, and noncomprehension.

Regardless of the method of detection, once stress is apparent an escape route built into the course must be exercised to alleviate the stress. Here is where individualizing comes into play and why it is desirable to have background knowledge of the student. This student understanding would permit the computer to select the correct approach to reducing stress and improving learning. Deviation is the key; that is, a change of pace of work. This could cover the continuum of alternatives from a review of previous work, a change of subject, a game, to asking the student to leave the terminal and take a

break. The CAI course, like a good teacher, should know when the student has had enough so that the material can be given with as little stress to the student as possible.

IV. Student evaluation during the learning process should remain confidential to the student.

Once it becomes apparent to the student that the computer is reporting his progress to a third party on a regular basis, there will most likely be a change in motives on the part of the student. Under a confidential relationship, his motive is generally to learn. It would tend to switch to obtain a good grade if his progress is being monitored. The latter motive, good grades, places the student under considerably more stress than when learning alone is the motive thereby lessening his capability to learn. This does not mean that responses cannot be tallied so that the course could be improved; it just means that the responses will not be keyed to the student.

Conclusion

Studies in the field of stress are almost unanimous in agreement that for the average person stress reduces their cognitive functioning. Therefore, it is my belief that if additional research could be performed toward the implementation of the above four recommendations for CAI courses, that the resultant reduction in stress would be accompanied by a notable increase in learning on the part of the student.